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How to Recognize Some Common Alfalfa Troubles

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A PATCH OF ALFALFA PLANTS KILLED BY ALFALFA-SNOUT-BEETLE GRUBS

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HOW TO RECOGNIZE SOME COMMON ALFALFA TROUBLES

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This publication describes some of the more common alfalfa troubles in New York State. It is intended to be an aid to dairy farmers who may have alfalfa fields that yield poorly, or in which a stand is difficult to maintain because of one or more of these troubles. Emphasis is placed upon the disturbances that are believed to be of greatest practical importance to the State as a whole. It is not an exhaustive treatment of all known alfalfa ailments.

The importance of adding lime and superphosphate as well as of sowing hardy, adapted seed and inoculating it is generally recognized. If a field has not received these treatments, the ability to recognize the troubles described will be of little value. The necessity of following the recommended procedures for growing alfalfa is taken for granted.

LEAF SPOT

Perhaps the most widespread disease of alfalfa in New York State is caused by the fungus *Pseudopeziza medicaginis*. It produces dark-brown circular spots irregularly spaced over the leaves; hence the name "leaf spot." The lower leaves are first to be attacked, and they may or may not yellow and drop. The spots are visible on either side of the leaf but are more prominent on the upper surface. The appearance of leaflets affected by leaf spot at different degrees of severity are shown in Plate I, A.

The disease may be found in any field during the entire summer. The affected leaves may fall; therefore, the hay is poor both in yield and quality. There is no practical control for leaf spot; but, because injury is more severe on over-ripe than on under-ripe plants, losses can be reduced markedly by early cutting.

No other fungous diseases in the State are of such great importance as is leaf spot.

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BACTERIAL WILT

BACTERIAL WILT is caused by a bacterium, *Phytomonas insidiosa,* which plugs the vessels that ordinarily conduct water. Actual wilting may be observed in the field but it is neither a common nor an adequate means of diagnosis. The leaves of affected plants may be a normal green color, but in extreme cases they turn yellow and die. The shoots may spread laterally near the ground before growing upright. A common type of injury to the above-ground portion of a diseased plant is shown in Plate I, B. In more severe attacks shoot growth is stunted more than that shown.

In the field the best indication of this trouble is the yellowish brown to brown root tissue that is visible when the bark of the root is peeled. Healthy roots do not show this darkening, but are nearly white. This is shown in Plate I, C.

The plants severely affected eventually die, either during the summer or throughout the winter months. Whole fields may be attacked rather uniformly, but usually the disease starts in various patches over the field, and these gradually enlarge. In general, bacterial wilt is more noticeable during the last part of the summer. It has been found in every alfalfa-growing section of the State and undoubtedly causes some of the damage that has been attributed to winter-killing and summer-killing.

Fortunately, the organism multiplies slowly, and usually it is not before the third year of hay that great damage has been done to the stand. At present, there is no adequate control measure except to adopt a shorter rotation in which the infested field is allowed to remain out of alfalfa for at least two years. This does not completely prevent recurrence of bacterial wilt. The organism is carried by machinery and by hoofs of animals, making it desirable to modify mowing or grazing practices to reduce the spread of the disease from one field to another. In some of the Western States, disease-resistant varieties have been used with considerable success, but at present no resistant variety can be recommended for New York. Because it is widespread and difficult to control, it is considered by many to be the most serious menace to alfalfa in this State.

POTASH DEFICIENCY

THE alfalfa plant produces characteristic symptoms of potassium starvation that are extremely valuable in detecting a deficiency of potash in the soil. Potash-deficient plants are shown in Plate I, D and E. As shown in D, small white spots around the margin first appear on the green leaves, and later the tissue between these spots becomes yellowish green to yellow, and finally dies and becomes brown. The severity of marginal yellowing increases progressively from the top of the shoot down to the

older leaves. As shown in E, there may be few white spots, but marginal yellowing is prominent. The yellowing is more severe on the older, lower leaves than on the younger ones. Potassium is readily translocated within the plant, and, under conditions of potash starvation, is constantly being removed to the top of a shoot from the lower leaves. This may account for the increased severity of the symptoms on the lower leaves.

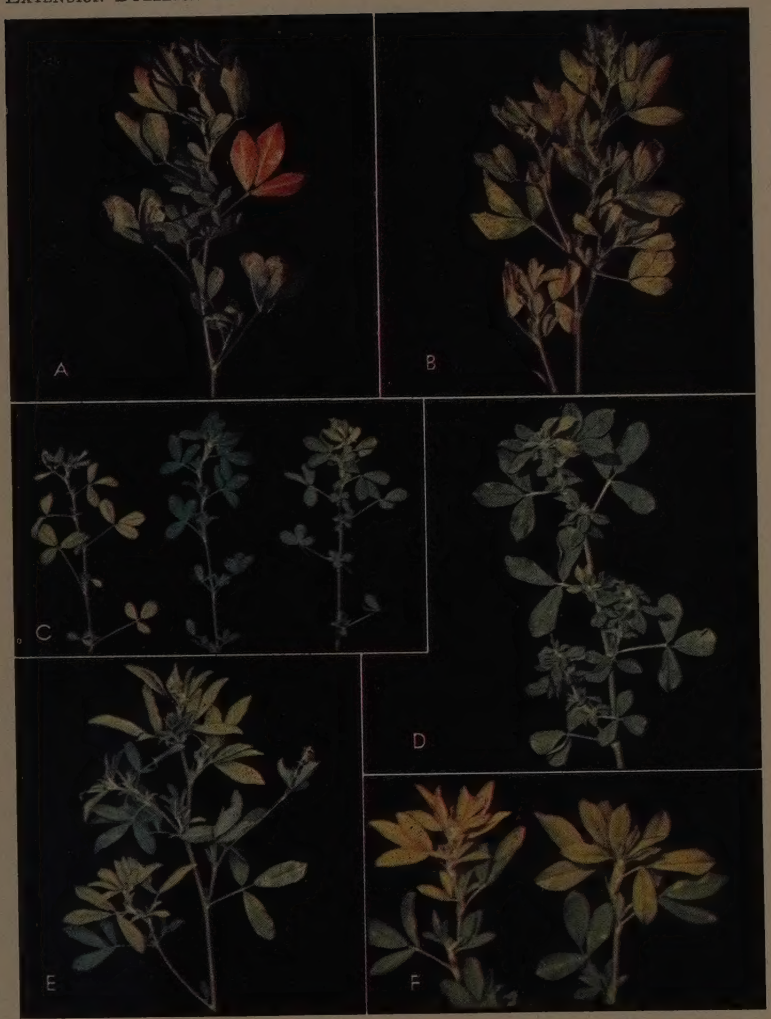
The symptoms show most readily on rapidly-growing plants. They may appear early in the spring when growth is rapid and gradually disappear when, for some reason, growth is retarded. They may, however, persist nearly all summer on second- or third-crop hay.

Predominance of potash-deficiency symptoms in a field that is not yielding well and in which a stand cannot be maintained even though other conditions seem right, indicates the need for added potash. A suggested practice for field trials on small areas is an early-spring or fall application of from 300 to 400 pounds to an acre of muriate of potash. It is doubtful whether a top-dressing represents the most profitable method of applying potash, but a need for this material is easily determined. Yield increases of more than a ton of hay an acre from a top-dressing of 400 pounds of muriate of potash have been obtained in a single cutting where the potash supply was extremely low and where no other factor was seriously limiting. Stands have been shown to persist several years longer on potash plots than on those that received no potash. In some fields, the thinning of the stand has been attributed to winter-killing when, actually, the plants were so weakened from a lack of potassium that they were unable to withstand the winter. They may die out even during the summer. When seeding alfalfa on soils known to be deficient in potash, applications of from 150 to 300 pounds an acre should be made at seeding time.

More and more soils in this State, which have heretofore had an adequate supply of potash for alfalfa, are beginning to be depleted by heavy crop removals. A 3-ton crop of alfalfa removes approximately 125 pounds of potash. This is equivalent to about 200 pounds of 60-per-cent muriate of potash. Approximately 75 to 85 per cent of the potash in cow manure is in the liquid portion, much of which may be lost. It is not surprising, therefore, that the potash supply is constantly being depleted, unless special precautions are taken to save the liquid portion of the manure.

"White spot," which is not recognized as potash deficiency, may be confused with it. As shown in Plate I, F, the white spots appear over the entire leaflets; they are not confined to the margins. No yellowing takes place between the spots, and there is less tendency for the disease to increase in severity on the lower leaves. This condition was described first in 1908 and, although it can be produced by certain irrigation practices, its real cause has not been determined. Probably it is not a serious problem in the State, but isolated plants are found in some areas, especially during early summer.

A. A fungous "leaf spot" showing degrees of severity. B. Bacterial wilt, showing wilting. C. Bacterial wilt showing darkened portions of diseased root (top) and lighter colored healthy root (bottom). D. Potash deficiency. E. Potash deficiency in which marginal yellowing is more prominent than spotting. F. "White Spot", cause unknown and relatively unimportant in New York



A. Leafhopper injury showing reddened leaflets (right) and reddened "V" at upper left. B. Severe leafhopper injury with yellow "V"-shaped areas in certain leaflets at center left and with blossom forming. C. Greenhouse. Left, leafhopper; center, healthy; and right, boron deficiency. D. Greenhouse. Boron deficiency with marked rosetting but little or no yellowing. E. Boron deficiency in which leaves near lateral terminal as well as main terminal are yellow. F. Boron deficiency: left advanced stage, right moderate stage. Note reddish tinge on certain leaflets of the plant at the left

BORON DEFICIENCY

BORON is an element found in boric acid and borax. It is essential for plant growth in quantities much smaller than those of nitrogen, phosphorus, potassium, or calcium. Although the quantity is small, alfalfa requires more boron for its normal growth than do most other forage crops.

The alfalfa plant produces definite symptoms of boron starvation that help to recognize a deficiency of boron in the soil. The leaves *near a growing point* are yellowed, sometimes reddened. Usually, this makes the top of the plant yellow, and all the lower leaves remain a healthy green color, as shown in Plate II, F. Sometimes lateral terminals are affected, and the leaves around them are likewise yellowed. The lower leaves below those near the growing points remain green. This is shown in Plate II, E.

The plants are stunted by a shortening of the terminal internodes. This is shown in Plate II, D, E, and F. Flowers fail to form and the buds appear as white or light-brown dead tissue, as shown in Plate II, D, E, and F (left).

Although these symptoms help to recognize a deficiency of boron in the soil, care must be exercised in their interpretation. They appear most abundantly during a period of drought, and may be absent during a season of normal moisture even though growth is retarded by a lack of boron. There is a tendency to minimize the extent of the trouble if observations are made only when the soil moisture is high. The tendency is to exaggerate the seriousness of the deficiency if observations are made only during a dry period, when the symptoms are widespread throughout a field. Usually the second and third crops are more severely affected than is the first. A field of alfalfa that shows pronounced boron-deficiency yellowing one year may show no symptoms whatsoever the next year if moisture is more plentiful. So closely are boron starvation and the appearance of boron-deficiency symptoms related to drought that the yellowing caused by boron deficiency is often attributed to "dry weather."

Boron deficiency is known to be a problem in those counties along Lake Ontario, the St. Lawrence River, Lake Champlain, and the Hudson River, and in Delaware and adjoining counties. Certain fields in other sections of the State are known to be lacking in boron, and some fields in the areas mentioned are adequately supplied.

Usually, the deficiency is more acute on light sandy soils, but heavy loams also may be deficient. Fields that have grown alfalfa for a period of years often show pronounced deficiency, whereas a stand on soil that has not previously grown alfalfa may be healthy. This is undoubtedly due to the heavy removal of boron by alfalfa as compared with other crops. From the application of 30 pounds of borax to the acre, which costs approximately $1.25 (not more than 50 to 60 cents an acre a year), yield increases of

1500 pounds of hay or 70 pounds of alfalfa seed have been obtained from a single cutting. Unless boron is extremely deficient and unless all other nutrient elements are adequately supplied, it is not likely that benefits so great as these will result; but, in view of the low cost of a borax application, smaller increases make its use a profitable practice. It may be applied to established stands at a rate of from 20 to 30 pounds an acre any time during the year when top growth is short, but late spring or summer applications, before growth begins or after first cutting, may give no benefit during that season. If it is to be mixed with other fertilizer for either spring or fall seedings, care should be taken to prevent direct contact of borax with the alfalfa seed or with the nurse crop. Either a cyclone seeder or a wheel-barrow seeder may be used for broadcast applications. One application will last at least two or three years and, if alfalfa is allowed to remain longer, it may be advisable to add additional borax equivalent to 10 pounds an acre a year. Under no conditions should the rate of application exceed 30 pounds an acre. Damage may result to the alfalfa or to the crop following.

LEAFHOPPER INJURY

THE common potato leafhopper, *Empoasca fabae,* is widespread in New York State. During middle or late summer it causes pronounced yellowing and reddening of alfalfa plants in many fields. The effects of this insect are, in some respects, similar to the boron-deficiency discoloration already described, but, because of its feeding habits, certain differences in the type of injury can be recognized. The leafhopper inserts its beak into the petiole or into the underside of the mid-rib of the leaf. This causes an accumulation of carbohydrates above the point of feeding and, as a result, certain yellow and red pigments become visible.

Since the insect feeds on leaves that are not necessarily confined to a terminal point, the reddened or yellowed leaves are at various heights on a shoot. This is shown in Plate II, A and B. In A (right) the feeding has been on the petiole and the three uniformly reddened leaflets are not near a terminal point.

When the leafhopper punctures the mid-rib of the leaf, yellowing or reddening discoloration is in the form of a "V," in which the apex represents the point of feeding. This is shown in Plate II, A (upper left) and on certain leaflets in B (near left center). The existence of this V-type of yellowing or reddening provides one of the best means of recognizing leafhopper injury and of differentiating it from boron deficiency. In Plate II, B, the purple blossom is forming in spite of severe leafhopper attack. This is helpful also as a means of distinguishing leafhopper injury from boron deficiency.

Leafhoppers usually attack the edges of a field most severely. A strip cut a few days earlier than the rest of the field may support a heavier population

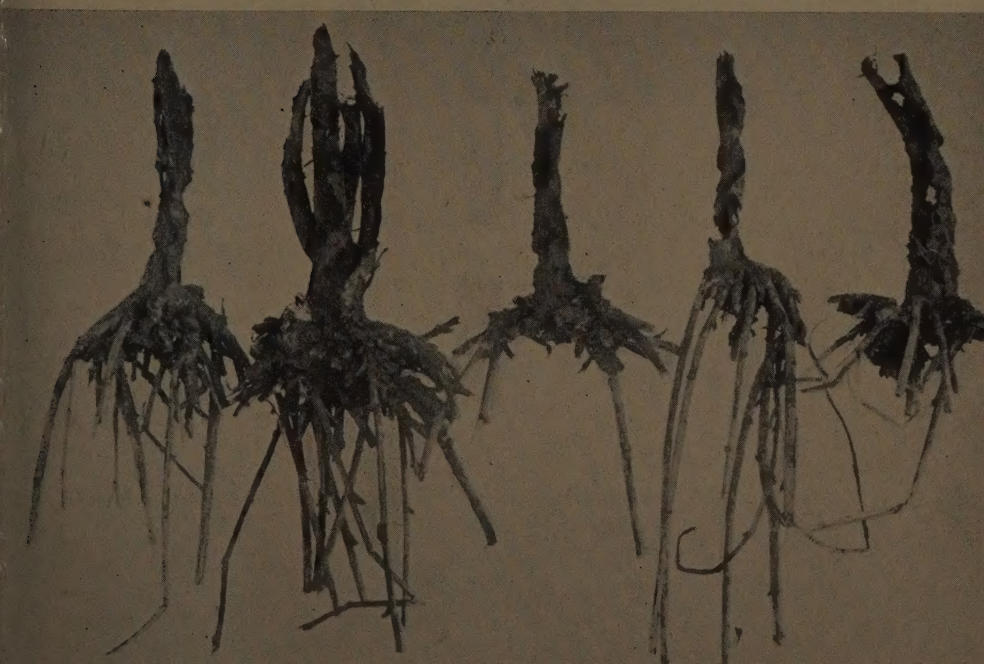
on the following crop than the rest of the field because they migrate to the more succulent plants. Their damage seldom becomes severe until the hay is nearly ready to cut, however, and prompt cutting when injury appears is the only control measure necessary in New York State. This practice removes some of the eggs and young from the field, and injury to new growth is not apparent for some time.

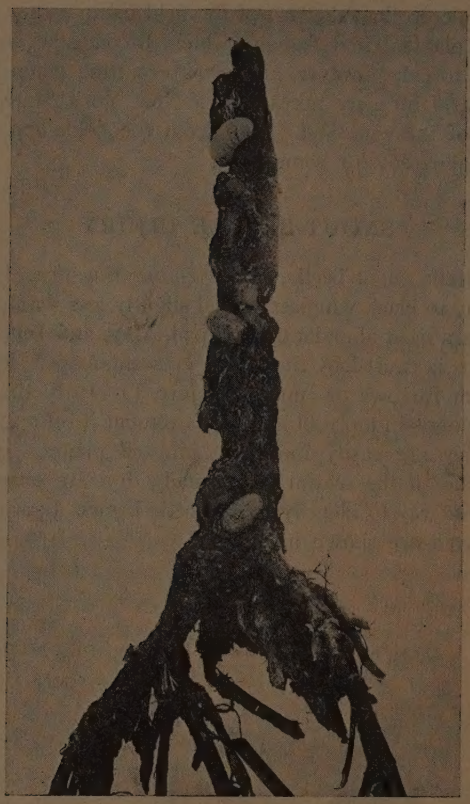
SNOUT-BEETLE INJURY

THE adult alfalfa snout beetle, *Brachyrhinus ligustica* (L.), is an oval-shaped, gray to black wingless weevil slightly less than one-half inch in length. It appears most abundantly in April, May, and June. The principal injury, however, is caused by the white, crescent-shaped, legless grubs, or larvae. They eat furrows or tunnels (figure 1) nearly the diameter of a lead pencil on the main tap root and may even cut it off a few inches below the crown. They are easily found on infested plants, especially during August, or earlier if the season is unusually dry. An examination of the root is the surest way to identify snout-beetle injury. Larvae at work on a badly injured root are shown in figure 2.

FIGURE 1. ALFALFA PLANTS KILLED BY ALFALFA-SNOUT-BEETLE GRUBS

PHOTOGRAPH FROM CHARLES PALM





PHOTOGRAPH FROM CHARLES PALM

FIGURE 2. LARVAE OF SNOUT BEETLE AT WORK ON A BADLY INJURED ROOT

At present the alfalfa snout beetle is confined to a part of the lake-shore areas of Oswego and Jefferson Counties. Although every effort is being made to prevent its spread by a supervised baiting program, it may eventually appear in other parts of New York and northern United States.

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